

What is claimed is:

- 1 1. A semiconductor device deposited on a surface suitable for epitaxial growth having a
2 first lattice constant and a first thermal evaporation rate manufactured by a method
3 comprising the steps of:
 - 4 a) depositing a lattice-mismatched layer, having a second lattice constant in no-
5 strain state, which is different of the lattice constant of the surface, wherein
6 the lattice-mismatched layer has a second thermal evaporation rate, wherein
7 the lattice-mismatched layer is deposited until at least one dislocation in the
8 lattice-mismatched layer is created and a desired thickness is reached;
 - 9 b) depositing a cap layer, having a third lattice constant and a third thermal
10 evaporation rate wherein the third thermal evaporation rate is lower than
11 the second evaporation rate, such that the cap layer nucleates selectively on
12 at least one region of the lattice-mismatched layer such that the at least one
13 dislocation is not covered by the cap layer; and
 - 14 c) annealing the device at a temperature and duration, such that the at least one
15 dislocation is eliminated by local evaporation of the nearby region of the
16 lattice-mismatched layer.
- 1 2. The semiconductor device of claim 1, wherein the method of manufacture further
2 comprises the step of, prior to step (a), depositing an epilayer on the surface.
- 1 3. The semiconductor device of claim 2, wherein the method of manufacture further
2 comprises the step of, after step (c), overgrowing an additional layer of the epilayer
3 on the device.
- 1 4. The semiconductor device of claim 1, wherein the at least one dislocation is selected
2 from the group consisting of:
 - 3 a) at least one dislocation network;
 - 4 b) at least one local dislocation;

5 c) at least one local defect dipole; and

6 d) at least one dislocated three-dimensional cluster.

1 5. The semiconductor device of claim 1, wherein the difference between the lattice
2 constant of the cap layer in no-strain state and the surface is smaller or of opposite
3 sign than the difference between the lattice constant of the lattice-mismatched layer
4 and the surface.

1 6. The semiconductor device of claim 1, wherein step (a) is performed using a growth
2 technique selected from the group consisting of:

3 a) molecular beam epitaxy deposition; and

4 b) metal-organic chemical vapor deposition.

1 7. The semiconductor device of claim 1, wherein steps (a) and (b) are repeated two times
2 to twenty times.

1 8. The semiconductor device of claim 1, wherein steps (b) and (c) are repeated two to
2 forty times.

1 9. The semiconductor device of claim 1, wherein steps (a) through (c) are repeated two to
2 forty times.

1 10. The semiconductor device of claim 1, wherein the semiconductor device is selected
2 from the group consisting of:

3 a) a diode laser;

4 b) a light-emitting diode;

5 c) a photodetector

6 d) a light amplifier

7 e) a far intraband infrared intraband detector;

- 8 f) an intraband far infrared emitter;
- 9 g) a heterojunction bipolar transistor;
- 10 h) a resonant tunneling diode;
- 11 k) a solar cell;
- 12 l) an optically bistable device;
- 13 m) an injection laser; and
- 14 n) a vertical cavity surface emitting laser.